BACTERIAL STRAIN LIST

TABLE A.2 Bacterial Strains

Strain	Genotype	Remarks
71/18	*supE thi* Δ(*lac-proAB*) F′ [*proAB*$^+$ *lacI*^{q} *lacZ*ΔM15]	A strain used for growth of phagemids. It makes high levels of *lac* repressor and is used for inducible expression of genes that are under the control of the *lac* promoter. This strain can be used for detection of recombinants expressing β-galactosidase fusion proteins (Messing et al. 1977; Dente et al. 1983; Rüther and Müller-Hill 1983).
BB4	*supF*58 *supE*44 *hsdR*514 *galK*2 *galT*22 *trpR*55 *metB*1 *tonA* Δ*lac*U169 F′ [*proAB*$^+$ *lacI*^{q} *lacZ*ΔM15 Tn*10*(*tet*^{r})]	A *recA*$^+$ strain used for growth of λZAP and other λ bacteriophages. The F′ in this strain carries *lacZ*ΔM15, which permits α-complementation with the amino terminus of β-galactosidase encoded in λZAP. The F′ allows superinfection with an M13 helper bacteriophage, a step required for converting a recombinant λZAP to a pBluescript plasmid (Bullock et al. 1987).
BHB2688	(N205 *recA* [λ*imm*434 c*Its b*2 *red E*am *S*am/λ])	A bacteriophage λ lysogen used to prepare packaging extracts (Hohn and Murray 1977; Hohn 1979).
BHB2690	(N205 *recA* [λ*imm*434 c*Its b*2 *red D*am *S*am/λ])	A bacteriophage λ lysogen used to prepare packaging extracts (Hohn and Murray 1977; Hohn 1979).
BL21(DE3)	*hsdS gal* (λc*Its*857 *ind*1 *S*am7 *nin*5 *lac*UV5-T7 gene *1*)	A strain employed for high-level expression of genes cloned into expression vectors containing bacteriophage T7 promoter. Bacteriophage T7 RNA polymerase is carried on the bacteriophage λ DE3, which is integrated into the chromosome of BL21 (Studier and Moffatt 1986).
BNN102 (C600*hflA*)	*supE*44 *hsdR thi*-1 *thr*-1 *leuB*6 *lacY*1 *tonA*21 *hflA*150[*chr*::Tn*10*(*tet*^{r})]	An *hflA* strain used to select λgt10 recombinants. The high frequency lysogeny mutation suppresses plaque formation by *c*I$^+$ bacteriophages but allows plaque formation by recombinant *c*I$^-$ bacteriophages (Young and Davis 1983a).
C-1a	A wild-type strain.	A clone of *E. coli* strain C wild type maintained on minimal medium for several years. *E. coli* C is F$^-$ and lacks host restriction and modification activity. It is a nonsuppressing host strain used in complementation tests with amber mutants of bacteriophage λ (Bertani and Weigle 1953; Borck et al. 1976).
C600 (BNN93)	*supE*44 *hsdR thi*-1 *thr*-1 *leuB*6 *lacY*1 *tonA*21	A suppressing strain often used for making lysates (Appleyard 1954) and for propagation of λgt10 (Young and Davis 1983a).
CES200	*sbcB*15 *recB*21 *recC*22 *hsdR*	A strain used for growth of Spi$^-$ bacteriophages (Nader et al. 1985).
CES201	*recA sbcB*15 *recB*21 *recC*22 *hsdR*	A recombination-deficient strain used for growth of Spi$^-$ bacteriophages (Wyman and Wertman 1987).
CJ236	*dut*1 *ung*1 *thi*-1 *relA*1/pCJ105(*cam*^{r} F′)	A *dut*$^-$*ung*$^-$ strain used to prepare uracil-containing DNA for site-directed mutagenesis experiments (Kunkel et al. 1987). pCJ105 carries an F′ and *cam*^{r}; growth of CJ236 in the presence of chloramphenicol selects for retention of the F′.
CSH18	*supE thi* Δ(*lac-pro*) F′ [*proAB*$^+$ *lacZ*$^-$]	A suppressing strain used to screen recombinants made in bacteriophage λ vectors carrying a *lacZ* gene in the stuffer fragments. These vectors give rise to blue plaques in the presence of the chromogenic substrate X-gal; recombinants in which the stuffer fragment has been replaced by foreign DNA give rise to white plaques (Miller 1972; Williams and Blattner 1979).
DH1	*supE*44 *hsdR*17 *recA*1 *endA*1 *gyrA*96 *thi*-1 *relA*1	A recombination-deficient suppressing strain used for plating and growth of plasmids and cosmids (Low 1968; Meselson and Yuan 1968; Hanahan 1983).

TABLE A.2 (*continued*)

Strain	Genotype	Remarks
DH5	*supE*44 *hsdR*17 *recA*1 *endA*1 *gyrA*96 *thi*-1 *relA*1	A recombination-deficient suppressing strain used for plating and growth of plasmids and cosmids (Low 1968; Meselson and Yuan 1968; Hanahan 1983). This strain has a higher transformation efficiency than DH1.
DH5α	*supE*44 Δ*lac*U169 (ϕ80 *lacZ*ΔM15) *hsdR*17 *recA*1 *endA*1 *gyrA*96 *thi*-1 *relA*1	A recombination-deficient suppressing strain used for plating and growth of plasmids and cosmids. The ϕ80 *lacZ*ΔM15 permits α-complementation with the amino terminus of β-galactosidase encoded in pUC vectors (Hanahan 1983; Bethesda Research Laboratories 1986).
DP50*supF*	*supE*44 *supF*58 *hsdS*3($r_B^- m_B^-$) *dapD*8 *lacY*1 *glnV*44 Δ(*gal-uvrB*)47 *tyrT*58 *gyrA*29 *tonA*53 Δ(*thyA*57)	A strain used for isolation and propagation of bacteriophage λ recombinants (Leder et al. 1977; B. Bachmann, pers. comm.).
ED8654	*supE supF hsdR metB lacY gal trpR*	A suppressing strain commonly used to propagate bacteriophage λ vectors and their recombinants (Borck et al. 1976; Murray et al. 1977).
ED8767	*supE*44 *supF*58 *hsdS*3($r_B^- m_B^-$) *recA*56 *galK*2 *galT*22 *metB*1	A recombination-deficient suppressing strain used for propagation of bacteriophage λ vectors (Murray et al. 1977).
HB101	*supE*44 *hsdS*20($r_B^- m_B^-$) *recA*13 *ara*-14 *proA*2 *lacY*1 *galK*2 *rpsL*20 *xyl*-5 *mtl*-1	A suppressing strain commonly used for large-scale production of plasmids. It is an *E. coli* K12 × *E. coli* B hybrid that is highly transformable (Boyer and Roulland-Dussoix 1969; Bolivar and Backman 1979).
HMS174	*recA*1 *hsdR rif*^{r}	A recombination-deficient nonsuppressing strain used for high-level expression of genes cloned into expression vectors containing bacteriophage T7 promoter. Bacteriophage T7 RNA polymerase is provided by infection with a bacteriophage λ that carries bacteriophage T7 gene *1* (Campbell et al. 1978; Studier and Moffatt 1986).
JM101[a]	*supE thi* Δ(*lac-proAB*) F′ [*traD*36 *proAB*$^+$ *lacI*^{q} *lacZ*ΔM15]	A strain that will support growth of vectors carrying amber mutations (Messing 1979).
JM105	*supE endA sbcB*15 *hsdR*4 *rpsL thi* Δ(*lac-proAB*) F′ [*traD*36 *proAB*$^+$ *lacI*^{q} *lacZ*ΔM15]	A strain that will support growth of vectors carrying amber mutations and will modify but not restrict transfected DNA (Yanisch-Perron et al. 1985).
JM107[b]	*supE*44 *endA*1 *hsdR*17 *gyrA*96 *relA*1 *thi* Δ(*lac-proAB*) F′ [*traD*36 *proAB*$^+$ *lacI*^{q} *lacZ*ΔM15]	A strain that will support growth of vectors carrying amber mutations and will modify but not restrict transfected DNA (Yanisch-Perron et al. 1985).
JM109[b,c]	*recA*1 *supE*44 *endA*1 *hsdR*17 *gyrA*96 *relA*1 *thi* Δ(*lac-proAB*) F′ [*traD*36 *proAB*$^+$ *lacI*^{q} *lacZ*ΔM15]	A recombination-deficient strain that will support growth of vectors carrying amber mutations and will modify but not restrict transfected DNA (Yanisch-Perron et al. 1985).
JM110	*dam dcm supE*44 *hsdR*17 *thi leu rpsL lacY galK galT ara tonA thr tsx* Δ(*lac-proAB*) F′ [*traD*36 *proAB*$^+$ *lacI*^{q} *lacZ*ΔM15]	A strain that will not modify *Bcl*I sites and will support growth of vectors carrying amber mutations (Yanisch-Perron et al. 1985).
K802	*supE hsdR gal metB*	A suppressing strain used to propagate bacteriophage λ vectors and their recombinants (Wood 1966).
KK2186	*supE sbcB*15 *hsdR*4 *rpsL thi* Δ(*lac-proAB*) F′ [*traD*36 *proAB*$^+$ *lacI*^{q} *lacZ*ΔM15]	A strain that will support growth of vectors carrying amber mutations and will modify but not restrict transfected DNA (Zagursky and Berman 1984).

LE392	*supE*44 *sup*F58 *hsdR*514 *galK*2 *galT*22 *metB*1 *trpR*55 *lacY*1	A suppressing strain commonly used to propagate bacteriophage λ vectors and their recombinants. LE392 is a derivative of ED8654 (Borck et al. 1976; Murray et al. 1977).
LG90	Δ(*lac-proAB*)	A strain in which *lacZ* is deleted that is used for detection of recombinants expressing β-galactosidase fusion proteins (Guarente and Ptashne 1981).
M5219	*lacZ trpA rpsL* (λ*bio*252 c*Its*857ΔH1)	A strain used for regulated expression of genes cloned downstream from the bacteriophage λ p_L promoter. It contains a defective λ prophage that encodes the bacteriophage λc*Its*857 repressor and N protein, which is an antagonist of transcription termination (Remaut et al. 1981; Shimatake and Rosenberg 1981).
MBM7014.5	*hsdR*2 *mcrB*1 *zjj*202::Tn*10*(*tet*^{r}) *araD*139 *ara*CU25am Δ*lac*U169	An *mcrB* strain used for λORF8 primary libraries. Libraries are made with DNA treated with methylases to protect *Hin*dIII and *Bam*HI sites. M.*Alu*I methylase is used to protect *Hin*dIII sites since M.*Hin*dIII methylase is not available commercially. This strain is defective in the restriction system that recognizes *Alu*I-methylated DNA sites (Raleigh and Wilson 1986).
MC1061	*hsdR mcrB araD*139 Δ(*araABC-leu*)7679 Δ*lac*X74 *galU galK rpsL thi*	An *mcrB* strain used for λORF8 primary libraries as described for the strain MBM7014.5 (Meissner et al. 1987).
MM294	*supE*44 *hsdR endA*1 *pro thi*	A suppressing strain used for large-scale production of plasmids. It is highly transformable (Meselson and Yuan 1968).
MV1184[d]	*ara* Δ(*lac-proAB*) *rpsL thi* (φ80 *lacZ*ΔM15) Δ(*srl-recA*)306::Tn*10*(*tet*^{r}) F′ [*traD*36 *proAB*$^+$ *lacI*^{q} *lacZ*ΔM15]	A recombination-deficient strain used to propagate phagemids pUC118/pUC119 and to obtain single-stranded copies of phagemids (Vieira and Messing 1987).
MV1193	Δ(*lac-proAB*) *rpsL thi endA spcB*15 *hsdR*4 Δ(*srl-recA*)306::Tn*10*(*tet*^{r}) F′ [*traD*36 *proAB*$^+$ *lacI*^{q} *lacZ*ΔM15]	A recombination-deficient strain used to propagate phagemids pUC118/pUC119 and to obtain single-stranded copies of phagemids (Zoller and Smith 1987).
MZ-1	*galK*Δ8*attL*Δ*Bam*N_7N_{53}c*Its*857ΔH1 *his ilv bio N*$^+$	A temperature-sensitive lysogenic strain used as a host for plasmids containing the bacteriophage λ p_L promoter (Nagai and Thøgersen 1984).
NM531	*supE supF hsdR trpR lacY recA*13 *metB gal*	A recombination-deficient suppressing strain used for propagation of bacteriophage λ vectors (Arber et al. 1983).
NM538	*supF hsdR trpR lacY*	A strain used for assay and propagation of bacteriophage λ (Frischauf et al. 1983).
NM539	*supF hsdR lacY* (P2cox)	A strain used for selection of Spi$^-$ bacteriophages. NM539 is a derivative of NM538 (Frischauf et al. 1983).
Q358	*supE hsdR* φ80^r	A *supE* host used for growth of bacteriophage λ vectors (Karn et al. 1980).
Q359	*supE hsdR* φ80^r P2	A *supE* host used to select Spi$^-$ recombinants (Karn et al. 1980).
R594	*galK*2 *galT*22 *rpsL*179 *lac*$^-$	A nonsuppressing strain used as a nonpermissive host for vectors containing amber or ochre mutations (Campbell 1965).
RB791	W3110 *lacI*^{q}L8	A strain that makes high levels of *lac* repressor and is used for inducible expression of genes under the control of the *lac* and *tac* promoters (Brent and Ptashne 1981).
RR1	*supE*44 *hsdS*20($r_B^-m_B^-$) *ara*-14 *proA*2 *lacY*1 *galK*2 *rpsL*20 *xyl*-5 *mtl*-1	A *recA*$^+$ derivative of HB101 that can be transformed with high efficiency (Bolivar et al. 1977; Peacock et al. 1981; B. Bachmann, pers. comm.).
SMR10	*E. coli* C (λ*cos*2 Δ*B xis*1 *red*3 *gam*am210 c*Its*857 *nin*5 *S*am7/λ)	A bacteriophage λ lysogen used to prepare packaging extracts (Rosenberg 1985).

TABLE A.2 *(continued)*

Strain	Genotype	Remarks
TAP90	*supE*44 *supF*58 *hsdR pro leuB thi*-1 *rpsL lacY*1 *tonA*1 *recD*1903::mini-*tet*	A host strain used for production of high-titer bacteriophage λ lysates. This restriction-deficient *supE supF* strain has a mini-*tet* insertion in *recD*, which improves growth of Spi$^-$ λ bacteriophages (Patterson and Dean 1987).
TG1	*supE hsd*Δ5 *thi* Δ(*lac-proAB*) F′ [*traD*36 *proAB*$^+$ *lacI*^{q} *lacZ*ΔM15]	An EcoK$^-$ derivative of JM101 that neither modifies nor restricts transfected DNA. It will support growth of vectors carrying amber mutations (Gibson 1984).
TG2	*supE hsd*Δ5 *thi* Δ(*lac-proAB*) Δ(*srl-recA*)306::Tn*10*(*tet*^{r}) F′ [*traD*36 *proAB*$^+$ *lacI*^{q} *lacZ*ΔM15]	A recombination-deficient derivative of TG1 (M. Biggin, pers. comm.).
XL1-Blue	*supE*44 *hsdR*17 *recA*1 *endA*1 *gyrA*46 *thi relA*1 *lac*$^-$ F′ [*proAB*$^+$ *lacI*^{q} *lacZ*ΔM15 Tn*10*(*tet*^{r})]	A recombination-deficient strain that will support the growth of vectors carrying some amber mutations, but not those with the *S*am100 mutation (e.g., λZAP). Transfected DNA is modified but not restricted. XL1-Blue is used to propagate λZAPII recombinants, which are unstable in BB4. The F′ in this strain allows blue/white screening on X-gal and permits bacteriophage M13 superinfection (Bullock et al. 1987).
XS101	*recA*1 *hsdR rpoB*331 F′ [*kan*]	A recombination-deficient strain that modifies but does not restrict transfected DNA. It carries an episome conferring resistance to kanamycin and is used for growth of phagemids (Levinson et al. 1984).
XS127	*gyrA thi rpoB*331 Δ(*lac-proAB*) *argE* F′ [*traD*36 *proAB*$^+$ *lacI*^{q} *lacZ*ΔM15]	A strain used for growth of phagemids (Levinson et al. 1984).
Y1089	*araD*139 Δ*lac*U169 *proA*$^+$ Δ*lon rpsL hflA*150[*chr*::Tn*10*(*tet*^{r})] pMC9	A strain used for protein production from λgt11 and λgt18–23 recombinants. Expression of the foreign protein is controlled by the high levels of *lac* repressor made by pMC9, which carries *lacI*^{q}. Y1089 is deficient in the *lon* protease, which may allow increased stability of the foreign proteins. Lysogens are formed at a high frequency in this strain (Young and Davis 1983b).
Y1090*hsdR*	*supF hsdR araD*139 Δ*lon* Δ*lac*U169 *rpsL trpC*22::Tn*10*(*tet*^{r}) pMC9	A strain used for immunological screening of expression libraries and propagation of λgt11 and λgt18–23 (Young and Davis 1983b; Jendrisak et al. 1987). Expression of the foreign protein is controlled by the high levels of *lac* repressor made by pMC9, which carries *lacI*^{q}. Detection of proteins toxic to *E. coli* can be achieved by adding IPTG several hours after initiation of plaque formation. Some proteins are unstable in *E. coli*. Y1090*hsdR* is deficient in the *lon* protease, which may allow increased stability of antigens for antibody screening. The *supF* marker suppresses *S*am100 to allow cell lysis (Young and Davis 1983b).
YK537	*supE*44 *hsdR hsdM recA*1 *phoA*8 *leuB*6 *thi lacY rpsL*20 *galK*2 *ara*-14 *xyl*-5 *mtl*-1	A recombination-deficient suppressing strain used for regulated expression of genes cloned downstream from the *phoA* promoter (Oka et al. 1985).

[a]Strain JM103 (Messing et al. 1981) is a restrictionless derivative of JM101 that has been used to propagate bacteriophage M13 recombinants. However, some cultivars of JM103 have lost the *hsdR*4 mutation (Felton 1983) and are lysogenic for bacteriophage P1 (which codes for its own restriction/modification system). JM103 is therefore no longer recommended as a host for bacteriophage M13 vectors. Strain KK2186 (Zagursky and Berman 1984) is genetically identical to JM103 except that it is nonlysogenic for bacteriophage P1.

[b]Strains JM106 and JM108 are identical to JM107 and JM109, respectively, except that they do not carry an F′ episome. These strains will not support the growth of bacteriophage M13 but may be used to propagate plasmids. However, JM106 and JM108 do not carry the *lacI*^{q} marker (normally present on the F′ episome) and are therefore unable effectively to suppress the synthesis of potentially toxic products encoded by foreign DNA sequences cloned into plasmids carrying the *lacZ* promoter.

[c]Strains JM108 and JM109 are defective for synthesis of bacterial cell walls and form mucoid colonies on minimal media. This does not affect their ability to support the growth of bacteriophage M13.

[d]The original strain of MV1184, constructed by M. Volkert (pers. comm.), did not carry an F′ episome. However, the strain of MV1184 distributed by the Messing laboratory clearly carries an F′ episome. It is therefore advisable to check strains of MV1184 on their arrival in the laboratory for their ability to support the growth of male-specific bacteriophages.

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